DIMENSIONS OF AIRCRAFT OCCUPANTS' MOTIVATION AND BEHAVIOUR

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Summary

The main aspects of aircraft emergency evacuations, e.g. passengers' panic, hesitations, personal phobias, threat underestimation, queuing behavior, crew communications, may be included in broader and fewer psychosocial dimensions (see G. Hofstede's work) constituting a peculiar reference system in a united and/or multidisciplinary perspective. The index values' variations of those dimensions with country of origin, age, gender, of each passenger, when mastered and adequately used may permit manifold noticeable improvements in safety provisions. Evacuation aspects in known accidents are the primary source of data. However evacuation tests also may have the possibility to furnish important information. The work is directed also to draw traits of possible research developments.

Preamble

This writing has the following purposes: to present a research in course of development and to furnish ideas for additional research. It is also directed to enhance the thought of the Authorities' members, even if engineers as the writer, on the matters concerning the understanding of the human motivation and behavior for safety purposes. It is dedicated first of all to the passengers, as the main destination of all safety provisions.

I. Dimensional considerations on human psychosocial aspects.

The present essay is based on data and research results showing that each person has psychosocial characteristics grounded on his natural and cultural heredity, which (see e.g. G. Hofstede, 1980, 1991) would be like a sort of mental programming. We may say that at least for what appears at the common culture level the corresponding cultural values, or anyway cultural features, are drawn mainly in the family culture where the persons were brought up, even if of course there is possibility of further different influences for the single case (see also Appendix 3 point 2.3.). These characteristics are expressed in few main dimensions of human motivation and behavior, where the word Dimension is due to the fact that someway (see Appendix 3 point 1.6.) they may be measured. At present they are known especially in the field of business and international co-operation, but also in other cases, e.g. about management by pilots (see Merritt A., 1994).

Let's apply them to aircraft evacuations, together with some additional considerations. With their listing we want first of all to ensure that the most evident aspects of human motivation and behavior and their variations have been covered in our considerations.

As a first methodological note, by our understanding the above characteristics are in fact varying from deterministic-like aspects to other individualistic-like aspects (see Appendix 3, point 2.6., and Appendix 3, point 1.6.).
As a more technical note, while examining the real accidents' casuistry the population of passengers and crew on an aircraft would correspond to a specific numeric determination of such dimensional characteristics. Our scope is to determine on this basis what may be expected to happen in an aircraft accident, and how can it be governed.
G. Hofstede's work is extensive and complex and it isn't possible to report and comment here all its results and implications, except where strictly necessary (see in any case in Appendixes 3 and 4). Let's recall here the main aspects of the Dimensions which he did determine on the IBM employees, with the note that a dimension Individualism was substituted by the writer (see Appendixes 3 and 4) with its complementary one, which by the same Hofstede was called the Collectivism, in the anthropological sense.
Their short description is as follows.
- Power Distance (e.g. respect in a hierarchical view, or interdependence at low index values)
- Uncertainty Avoidance (e.g. being part of a firm, being stressed, or, at low index values, being motivated by achievement)
- Collectivism (e.g. being part of a collectivity, or of a nuclear family at low index values)
- Masculinity (or femininity at low index values)

They are measured on the basis of statistic data by Indexes, whose abbreviations are respectively PDI, UAI, COLL and MAS.
It is a preliminary result of present research (see also Appendix 4A, Appendix 3) the fact that the first three of them have similarities, even if remaining different. A very schematic resume of this result is as follows.

	High	Low
PDI	need of command, hierarchy, order; sense of the chief	tendency to abolish excessive hierarchical distances
UAI	need of rules; sense of the community	tendency to abolish scissions, unnecessary rules
COLL	need of an adequate whole collective structure	tendency to privacy, nuclear family

The fourth dimension doesn't appear to have the same format. It is distinguished into Male and Female characteristics, as follows.

Masculinity	Femininity
e.g. assertiveness, search for money, fighting out of conflicts	e.g. caring for others, conflict resolution by compromise and negotiation

This differentiation between Masculinity and Femininity appears with great evidence among the most individualistic countries (e.g. USA, Sweden), and therefore appears as applicable

mainly to low threat regimes. It appears to be valid for Western countries (see Appendix 3, point 1.11., East/West)
We may then reach a first conclusion, that Hofstede's dimensions may be distinguished roughly conforming to general anthropological categories like kinship and marriage. This classification into three plus one Dimensions will be a valid and useful support in facilitating their understanding, and also in making easier further research considerations.

II. Further progress concerning aircraft evacuations

a) General
While applying some results of Hofstede's research to aircraft evacuations we are comparing mainly the passengers, but also the aircraft crew, to the IBM employees, utilizing as suitable the results of Hofstede's research. We prefer in that to make reference for any reason to the original IBM questionnaire, and first of all to its questions which resulted statistically more significant (see Appendix 4A Table 2).
The first evidence would be that, while in recent **evacuation tests** we may recognize roughly two of the four main dimensions, Individualism and Masculinity (see also in Appendix 5A), the other two, Power Distance and Uncertainty Avoidance, or their complementary aspects, are not pointed out in them. We will examine these further two dimensions first, and in more detail, as they appear to be meaningful for evacuations.

b) Uncertainty Avoidance.
Let's start from Uncertainty Avoidance, as it appears a basic aspect for evacuation. It may be interesting to know that the term was introduced by an American organization sociologist, James G. March. It was then, like PDI, predetermined with respect to the IBM research.
Let's make here some examples of extrapolation to Aircraft Evacuations.
Referring to the **High UAI range** of values they are as follows.

1. Stress

1.1. From the already cited Hofstede Questionnaire's main items we may note first of all **stress.** Like anxiety, it would be probably connected to limits, and to the importance given to them by a specific person. This appears as more or less directly applicable to the level of stress at which an aircraft occupant is subjected during an emergency (see however in Appendix 3 point 1.2. for kinds of anxiety).

1.2. A further possible application to aircraft occupants connected to stress derives from the fact that in High UAI countries allowed traffic speeds are proportional to the UAI values (see Hofstede 1980), irrespective from Accident death rates. The most near parallel would be with the 90 seconds requisite. But, also, for the evacuation we may expect for High UAI high tendency to develop a high evacuation speed despite the probability of consequent injuries, at limit panic, fighting included, that is what from a more behavioral viewpoint may be called a manifestation of Extreme Behavior. A greater evacuation speed may be however due to the realization of a functioning Mass (a ruled community of persons), whose corresponding in High PDI regimes (see below) is Centralization.

1.3. Disorientation is one of the items in the useful list of behavioral responses reported by H. Muir (1994), accompanied by anxiety. A comparison with other sources would indicate that

it may be also a characteristics of the passage from a flowing crowd to a crowd where flow under threat is stopped (see also Canetti, 1960). In this last case the single individuals do not have a common orientation any more, and therefore common disorientation would happen together with panic. Let's add that a characteristics of anxiety in social (political) situations is said to lead easily to psychical disorientation (see F. Neumann, 1957).

1.4. From what is referred by Hofstede (1991) about anxiety it has to be expected that also the cases of phobic personalities, e.g. suffering for vertigo, are proportional to UAI values in a population. This has however to be verified.

1.5. That the field of High UAI would be the field of threat overestimation, and vice versa for the Low UAI field, may be confirmed also by some typological considerations, see e.g. Hofstaetter, 1957 (citing Kretschmer), Cancrini et al. (1969, Chap. 2 Sect. 1). By means of interpretation we may also consider that the state of pertaining to a community is always in relationship to the respect of a sort of taboo (see also below), and therefore is characterized by a state of stress and alertness.

2. Mass

Aspects deriving from limits' proximity are however not the only, and the other main questions of the IBM questionnaire reveal also aspects connected to the sense of being part of a community, and of respecting its rules and procedures. They are probably the most important aspects, that is the **aspects concerning the existence of a community, or a Mass of people.**
As a further consideration with respect to the famous Freudian notions of Totem and Taboo, that of the Latin Sacer, a word addressed to guilty people (see E. Benveniste, 1969) would correspond to the sense of an opposed polarity (see F. Steiner, 1956), in an evacuation-like case that of a Mass under a High UAI regime. As much as Mass limits are approached by one or some of its components, stresses and doubts are increasing. Panic would correspond to the dissolution of the Mass (See Freud, 1921, Canetti, 1960).
We may then classify the sense of being part of a community as a positive aspect, and the excess of stress, degenerating into anxiety and panic, as negative aspects of the High UAI range of values.
Equally noticeable are the complementary characteristics, those of the **Low UAI range** of values. Let's distinguish them also between Positive and Negative aspects.

As <u>positive</u> aspects in evacuations we may derive from Hofstede's Tables (1991) (you may also see Table 1 in Appendix 4A) the following.
About stress Low UAI would concern easiness in uncommon situations, tendency to get out as an achievement, lack of anxiety (but see below on C. Cocco, Appendix 3, point 1.2) or panic. From the fact that in Low UAI countries car driving is less dangerous (see Hofstede, 1991) we could infer that at Low UAI regimes even evacuations should have better results, for the aspects of incidental injuries due to the evacuation itself.
About group motivation and behavior we should have tendency to reciprocal adjustment and to group self-co-ordination.
These kinds of events herein listed as positive aspects however are probably compatible with low to medium risk situations.

As <u>negative</u> aspects in common evacuation practice, from Hofstede's Tables (1991) (see also Table 1 in Appendix 4A) we may infer that Low UAI in medium to high risk situations could concern absent-mindedness, excessive slowness. As a complementary aspect to the above

mentioned overestimation of threat it may concern **underestimation of threat**. It would concern also excessive spirit of achievement, which may develop in competition between individuals when accompanied by High MAS.

c) Power Distance

About the notion of Power Distance Hofstede (1991) cites a Dutch psychologist, Mauk Mulder, who published his work in years 1976-77. Another work on the matters is that of F. Fiedler (1960), a social psychologist of the Illinois University (cited in Krech et al., 1970)

Focal questions for the Power Distance in the IBM questionnaire are directly concerning the kinds of headship, an aspect which may be easily translated into passengers' demand on the conduction style they would prefer or need.

The high PDI values would be expected to be correlated to Informational communication (ordering, top-down communication) and to hierarchical prioritization, centralizing. All this would be feasible with High PDI occupants' populations.

The Low PDI range of values would be related to interdependence, decentralization, relational intercommunication, bottom-up communication, self-prioritization (queuing behavior), noticeable reduction of hierarchical inequality and similar phenomena. Also this dimension appears then to be useful in understanding evacuation phenomena.

Positive aspects

In public organizations a centralization appears to correspond to a speedup of decisions and processes (see Knoke D. and Laumann E.O., 1982), and a decentralization would lead to slower decisions, but paying more attention to human aspects.

Let's note that this is a point of correspondence with the High UAI range, in accordance with the already seen similarity between PDI, UAI and COLL.

As a case of similarity with UAI we may expect that, as in the "horizontal" Mass the reference is the Mass companion, in the High PDI group the common reference point is the top leader, or the hierarchically nearest chief, equally divided between his followers. As in the current case, that of the Western culture, that equality is not the case, the parallels with UAI are more difficult.

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Negative aspects

Hofstede's work (1991) shows that a High PDI range may correspond to not only power and dependence, but also to counter-dependence and revolt. The excessive use of power may then possibly provoke opposite reactions during evacuations. In another context it may probably contribute to disruptive behavior. At lower Index levels excessive inertia, underestimation of threat may happen.

More in general we may speak about the possible not uniformity between what is expected or needed by the passengers and what is done or communicated by the crew. For example, in a high threat situation a passengers' whole composed all of High PDI personalities is expecting authoritative orders. If instead the inherent Cabin Crew have no the corresponding characteristics, confusion or panic among the passengers should be more probable.

Let's also make a hint to social aspects of PDI concerning quite directly the evacuation. Passengers' flight is a commercial transaction, and the kind of entertainment of the passengers is expected to be much in agreement with this aspect, which corresponds to Low PDI and UAI [see under point f) below]. There may be however occasions and passengers' populations

where a greater authority may be necessary.

d) Resume of the extrapolated PDI and UAI characteristics

Let's make a resuming table of the IBM Indexes' characteristics found above, as follows.

High UAI	Low UAI	High PDI:	Low PDI
Need of being part of a ruled community (mass)	Group self-coordination, reciprocal adjustment	Centralization, leading to speedup	Delegation, leading to slowness
Uneasiness in uncommon situations	Easiness in uncommon situations. Low sensitivity to danger, absent-mindedness	Top-down communication	Exchange of information
High sensitivity to danger, high stress, disorientation	Low evacuation speed, few evacuation injuries	Need of high crew personal influence, of imposed ordered queuing	Passengers' need of independence, group constitution, self-queuing
High evacuation speed, many evacuation injuries		Possibility of violence, revolts, seats jumping	Evolution of the situation

We don't have to wonder that in this table there are correspondences between some High UAI and High PDI items, see for example about evacuation speed, or about rules and order. This kind of connections, and, in many cases, extrapolations, might be performed systematically. This may lead to the compilation of larger and more complex Tables, where however the possible passages are quite depending on knowledge and experience of the researcher (see in Appendix 2).

In any case it is important to evaluate possible combined effects of PDI and UAI. An example of effects combination may be just that of panic, which in a crowd may develop starting from a single more sensitive personality, especially when there is lack of proper authority or guidance. This subject then implies both UAI (for sensitivity to panic) and PDI (for command, coordination) (see also Appendix 6B).

e) A parenthesis on the geographic distribution of the IBM Index values

Departing from the data on Index Values given in Hofstede (1991) we may first of all put them into a synoptic graphic form (see Graphs 1, 2 and 3 below). This reveals to be highly indicative of some characteristics common to many similar countries.

1. Considerations on proportions between PDI, UAI, COLL:

In the Oriental and other surrounding countries there is a great frequency of cases characterized by a value of UAI lower than PDI and COLL.

In the Latin and other similar or surrounding countries there is a great frequency of cases where UAI is much higher than PDI and COLL

In many of the countries having language of the Germanic language family (Swedish, English, German…) there is a great frequency of low PDI, UAI and especially COLL values.

2. Considerations on MAS

In countries of the Germanic linguistic family characterized by very low values of COLL we have a differentiation between countries presenting very low values of MAS (Sweden and similar) and those presenting high values of MAS (UK, USA and similar)

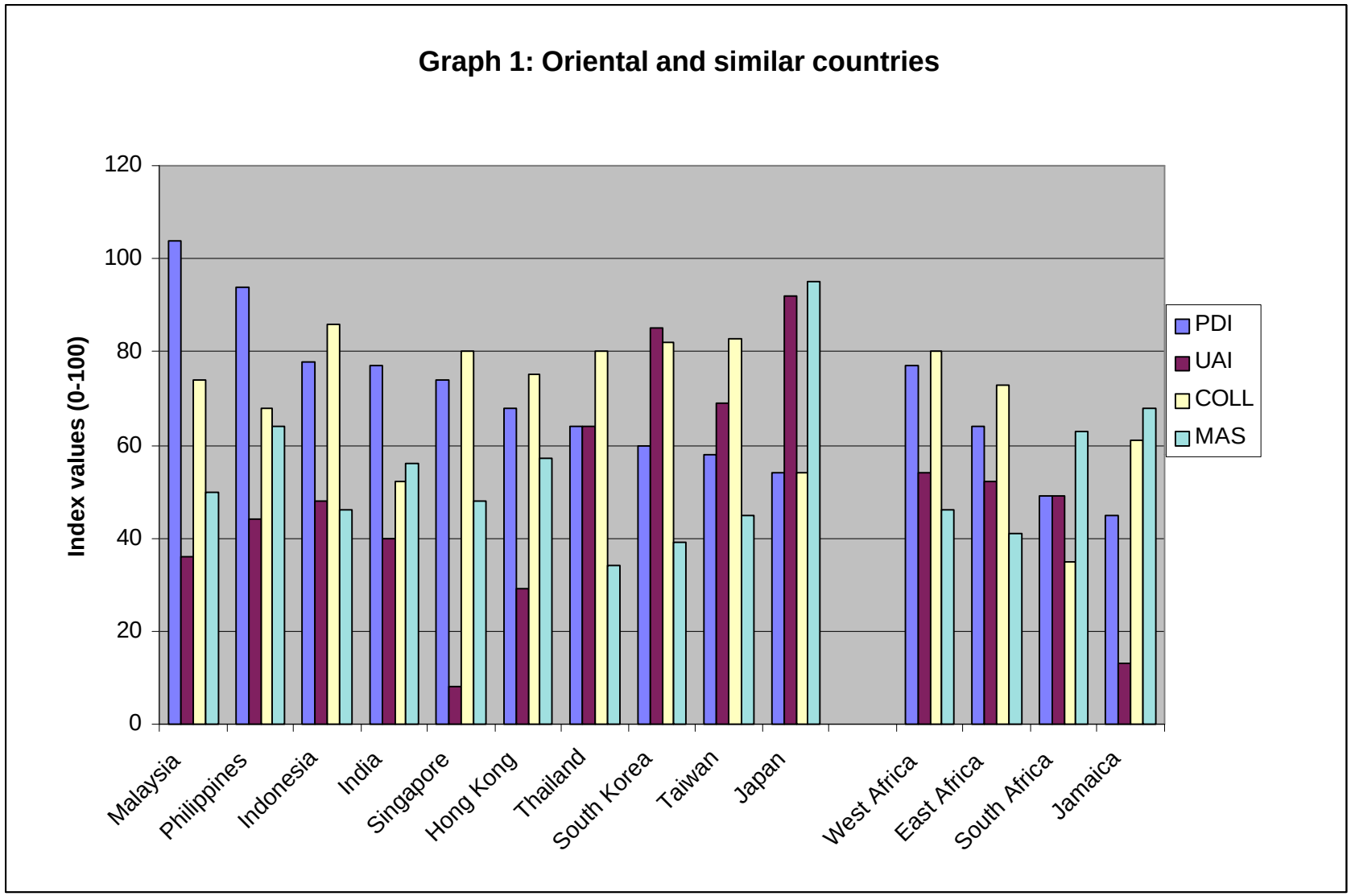
3. Interpretations on proportions between PDI, UAI and COLL.

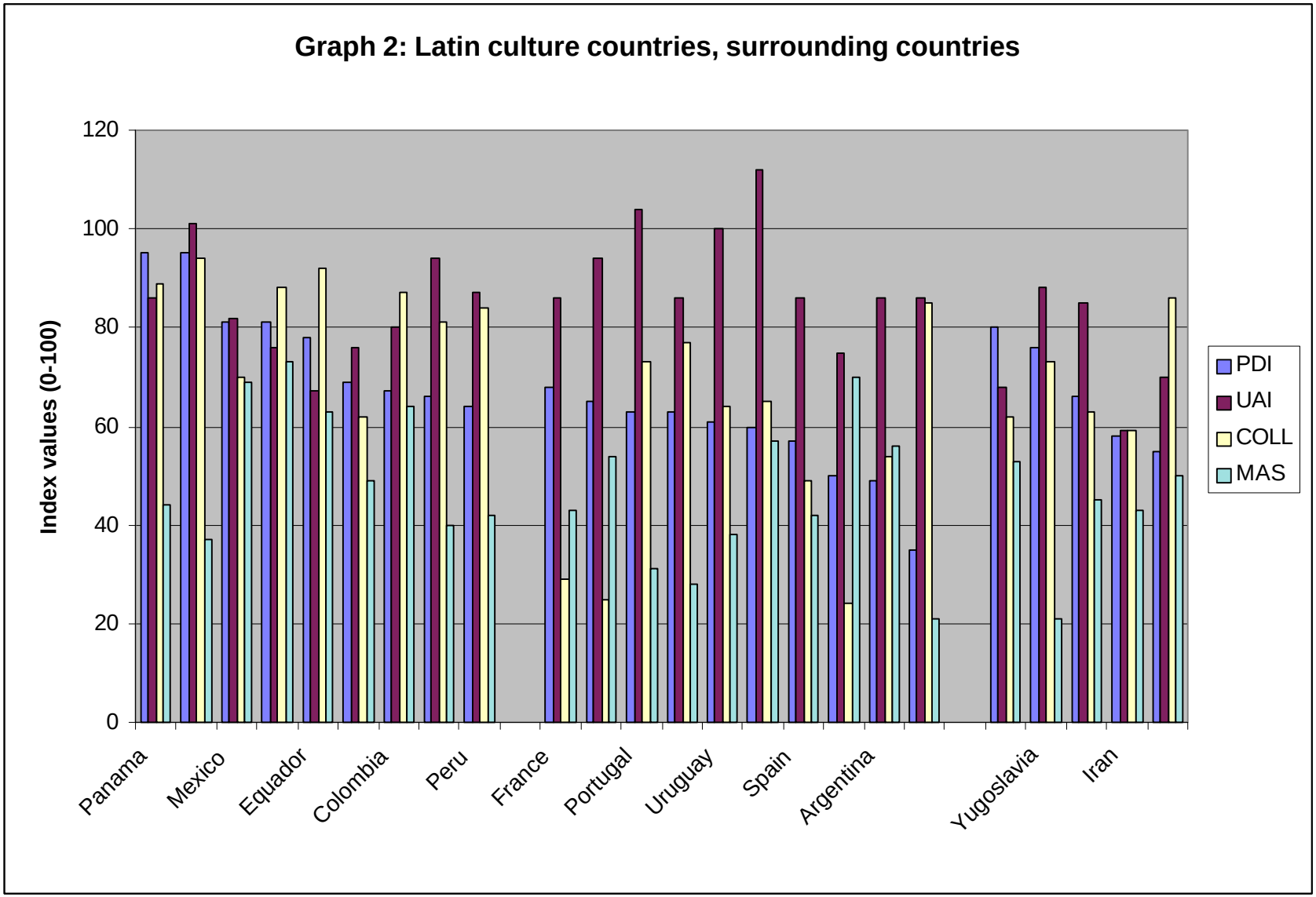
Let's start from those Oriental countries having UAI values minor than PDI and COLL values. The fact that most of these UAI values are relatively high may be possibly interpreted as the existence of a double social scheme, where however the aspect of the whole community prevails. In the case of the Firm, to remain adherent to the Questionnaire, this would mean that in many Oriental countries there would be a greater tendency to consider the clients of the Firm as part of a whole Collectivity including both Firm and clients, while in Western Countries, especially those having very low COLL index values, the tendency to consider the client as a single-occasion client may be stronger (see Albert M., 1991). This may mean different attitudes or tendencies when considering accidents, at least by people characterized by Low COLL values.

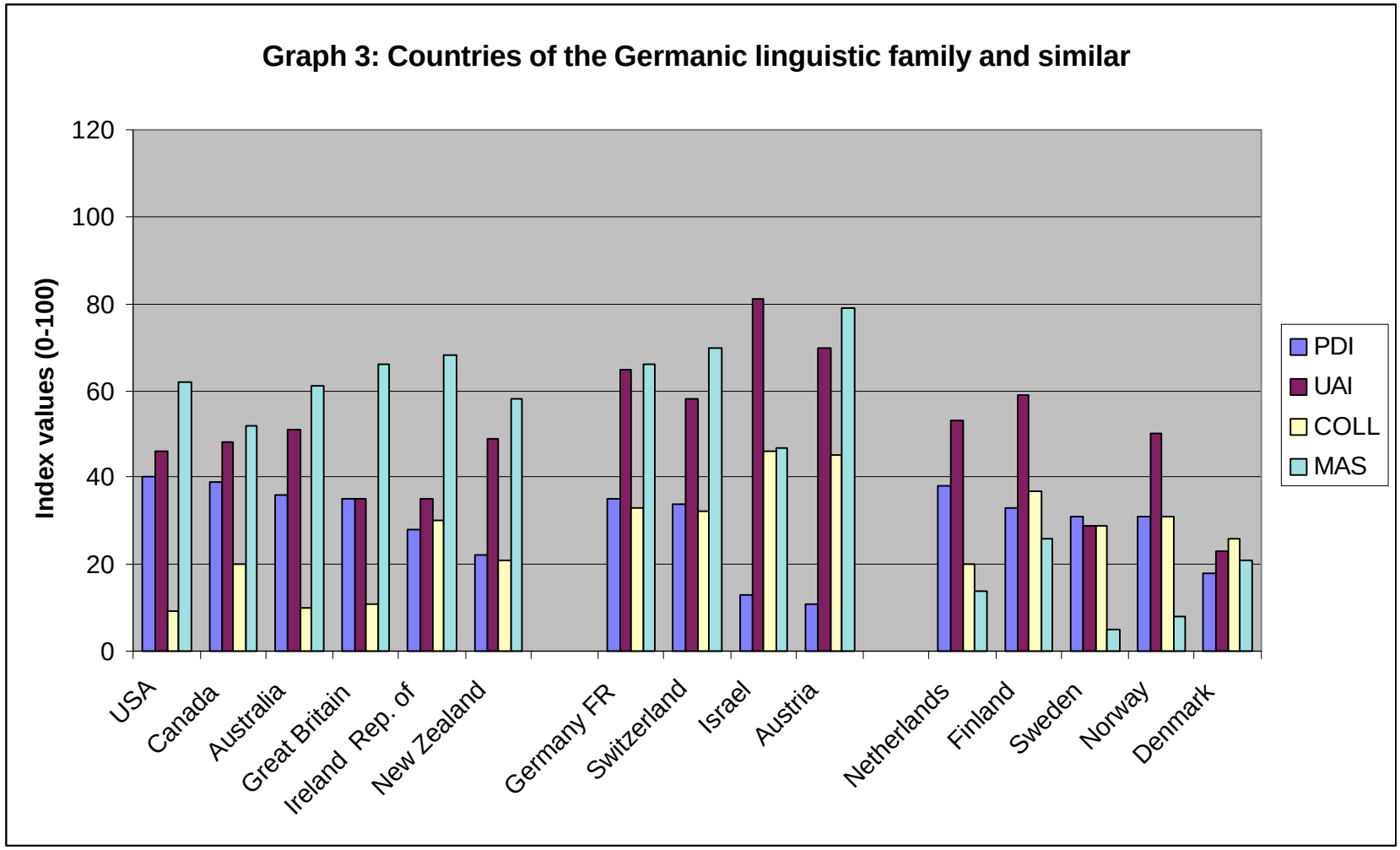
The stabilizing function of COLL has to be clarified.

The tendency of the western culture is to win: our rivals, the Evil. In a football game the tendency of each squad is of course to win. In some Eastern countries it could be to reach parity. In other words, in this case, even if there are two rival squads (quite high UAI) there is also a sense of Collectivity which forbids absolute victory.

This means that in an evacuation situation the western culture occupants are tending to use Dimensions like UAI which would be more suitable to a battle against a rival. In other words some of them may interpret the material threat, for example a crash, like the effect of a hostile human action. This may be also in part true, but that interpretation may be classified as deviant when this aspect is paramount.


Graph 1: Oriental and similar countries
Index values (0-100)
120
100
80
60
40
20
0
PDI
UAI
COLL
MAS
Malaysia
Philippines
Indonesia
India
Singapore
Hong Kong
Thailand
South Korea
Taiwan
Japan
West Africa
East Africa
South Africa
Jamaica


Graph 2: Latin culture countries, surrounding countries
Index values (0-100)
120
100
80
60
40
20
0
Panama
Mexico
Equador
Colombia
Peru
France
Portugal
Uruguay
Spain
Argentina
Yugoslavia
Iran
PDI
UAI
COLL
MAS


Graph 3: Countries of the Germanic linguistic family and similar
Index values (0-100)
120
100
80
60
40
20
0
USA
Canada
Australia
Great Britain
Ireland
Rep. of New Zealand
Germany FR
Switzerland
Israel
Austria
Netherlands
Finland
Sweden
Norway
Denmark
PDI
UAI
COLL
MAS

f) Combinations of PDI and UAI

In Hofstede's work, where on this subject H. Mintzberg (1983) is also cited, the combination of PDI and UAI assumes great importance for employees' Management. We may presume as first approximation that this is important also for the evacuation management. A translation to it could be as in the following Table:

Table 1 - Conduction of the passengers

High PDI	Direct personal influence of the Crew members	Full bureaucracy. Standardization of evacuation procedures
Low PDI	Mutual adjustment between occupants	Standardization of Crew competence.
	Low UAI	High UAI

A Standardization of the Results, which would be common in the USA, has been indicated as a coordination means of the whole, to be located at the convergence point of the four cells above. It is in any case a fact that the USA do have to coordinate different kinds of populations. What may be added at present is that there is some correspondence of this aspect with the assumption of a correct threat evaluation as a coordinating methodological characteristics (see also Appendix 2).

Let's make now an example on how to utilize other sources of information on similar dimensions. We may compare the above Table 1 picture with the theory of C. Perrow (1984), a known USA sociologist. We remember that in this theory we have two dimensions, which we may call: Centralization / Delegation and Solutions' Linearity / Complexity. Knowing the PDI and UAI characteristics we may then compare the Centralization with PDI, and the Solutions' Determination with UAI. We have then for example compatibility between decentralization and solutions' complexity, between centralization and solutions' linearity, and vice versa.

Let's resume in a preliminary table the C. Perrow's theory, as follows.

A recall of C. Perrow's theory

High centralization	Conflict between centralization and need of delegation: wrong orders	The two aspects are compatible: right orders, right decisions by the top.
Low centralization	The two aspects are compatible: right self-adjustment by the crowd	Delegation when there is only one solution: wrong decisions by the mass
	Low solutions' determination	High solutions' determination

Just a note may be that we are finding those two dimensions, PDI and UAI, in many contexts, see also on Decision Making (see Appendix 3 point 2.6.). We may then note that those dimensions have to be meaningful for the Western culture.

Trying to apply C. Perrow's theory recall to the Evacuation we have the following Table 2:

Table 2 – Passengers' conduction in the light of Perrow's theory

High PDI, Centralization	2. Crew gives simple and rapid commands, but the problem is complex.	1. Crew only decides. Only one solution per problem.
Low PDI, Delegation	4. Crew delegates Passengers in a complex situation with many possibilities of solution	3. Crew delegates the mass of passengers, but the problem has only one solution.
	Low UAI, Many solutions	High UAI, Only one solution

This Table would indicate that, even if the PDI and UAI values are those of a single country for both Crew and Passengers, in cell 2. and in cell 3. there may be reasons for some internal divergence. And the simplest scheme to support this divergence appears to be that of divergence between Crew and Passengers. Under this hypothesis the most dangerous case seems to be that of Cell 3., while Perrow's theory would indicate as more disastrous the case of Cell 2., for organizations like factories, offices. In fact a dangerous possibility would be not only that of prevalence of "not following" passengers, but also that of wrong, too linear decisions for a too complex problem. Of course also other schemes are possible.

A note is necessary at this point: many passages concerning the above and following Tables are made as **mental extrapolations** and theorization. Also, **they are made to show a simple example**, and in any case they would have to be confirmed by further research. However this kind of reasoning has to be kept in due account, in addition to for example computer modeling (see also Appendix 2. and Appendix 7.).

Let's resume all in the following Table 3, with a specific attention towards evacuation safety, and giving more importance to the mass of the passengers:

Table 3 – Details on the most critical conditions

High PDI, Centralization	Crew want to command excessively, simulating an overvaluation of threat. Under-valuation of threat by passengers as reaction. Revolt, seats jumping, unruly behavior.	Best conditions for an orderly evacuation
Low PDI, Delegation	Best conditions for a calm evacuation	Crew not able to centralize, to inform. Overvaluation of threat by passengers as reaction, panic. Crew need to have technical competence.
	Low UAI, Many solutions	High UAI, Only one solution

A note is about the effect on right perception of threat pointed out in the above Table: in fact this corresponds to the evidentiation of the different fields of values, High and Low, mostly for the UAI dimension. The tendency to obtain a right perception of threat may then be assumed as a main orientation of the research (see also in Appendixes 2 and 3).
Another main aspect is that the evacuation success may depend on passengers' composition as psychosocial characteristics. Their mean values in fact would indicate which kind of Evacuation management is more suitable. Also, the dispersion of Psychological characteristics' values would be a relevant aspect, especially in more theoretical, experimental or modeling considerations, also because it would quantify the amount of abnormal or limit cases.
In the present considerations the case of a single-country occupants' population has been considered to avoid complications. In practical developments the case of variations corresponding to the aircraft occupants being original from different countries should also be considered. However the main conclusions in the above Tables are expected to remain of the same type. Let's consider however that the existence of sub-dimensions, for example different forms of Power, and their differential values depending on the country, might lead to more differentiated results.

The picture is in any case not complete, and, as we said at the onset, has a value as example. **In fact other very important dimensions do exist: Collectivism (including Individualism), Masculinity**. It seems for example probable that a quite High COLL value in addition to High PDI and UAI values would favor stability of the evacuation process. In fact the meaning of COLL is probably that of considering a whole including its internal divisions, for example a firm together with its clients. COLL is also probably representing the frontier with the surrounding natural difficulties, while to UAI may probably correspond also the tendency to internal rivalry in a twofold collectivity, or something similar to it.
For example the condition High PDI Low UAI would probably be more dangerous in the sense indicated in Table 3 when also the additional condition Low COLL would be present.
Some equivalent considerations should be done also for the Oriental and similar countries. Probably for them a similar balance, that between PDI and COLL, is representing the best case.
We cannot miss to mention in addition that in relatively low threat conditions Low COLL, which would be High Individualism, may be an important aspect in dealing with the articulated technical reality.

g) Applications to experimentation

Current experimentation has limitations, e.g. geographic, as experimentation with intentional use of populations owing to different nationalities is not yet known to the Author.
In every case let's resume some characteristics of current experimentation (see also Appendix 5): focus on assertiveness of the cabin crew, to reach better evacuation rates, often incentives by money reward, to individuals or groups. This in fact seems the easiest fit with the contractual liaison with passengers and crew, the presence of nuclear families, even the use of a "business" class.
However other considerations may be: different culture of the passengers, even in presence of nuclear families, and the extreme conditions of many real accidents.
The extreme conditions cannot absolutely be reproduced in evacuation tests, and for these cases only data from real accidents and more or less theoretical considerations may be used.
The use of other populations together with realistic motivations, on the other side, may be quite easily performed. It is important to note that the motivations which may be used with

them may better approach real extreme conditions. Therefore the following Table 4, may represent not only an extension to experimentation with High PDI, UAI and COLL populations, but also a possible extension to the safe use of motivations better approaching real accident conditions. It is even important, in addition, to try to use motivations more corresponding to extreme conditions even with Low PDI, UAI and COLL populations, after having reached sufficient experience with High PDI, UAI and COLL populations.

Table 4 – Application to experimentation

High PDI, Centralization	Experimentation possible in low threat situations.	Experimentation possible in mean threat situations
Low PDI, Delegation	Great part of current experimentation (based on money rewards as motivation)	Experimentation risky, eventually possible only with adequate panic control means.
	Low UAI, Many solutions	High UAI, Only one solution

The most important aspects of this experimentation are evacuation conduction aspects in the most different conditions of occupants' culture and knowledge. These data should be also suitable as possible to furnish data for extrapolations to more extreme conditions than those experimented.

h) Collectivism and Masculinity

The two other dimensions, Collectivism and Masculinity, appear to be comparable to the major characteristics of current experimentation (see also Appendix 5A).
We may expect that to the Low PDI Low UAI condition in the Table 4 above also a Low COLL and a High or Low MAS are connected. A Low PDI Low COLL regime is expected to be stable in low threat conditions. High COLL High PDI regimes in high threat conditions have to be experimented or evaluated on the basis of real accidents' data.

MAS has been defined with reference to typical work situations, and a broader definition would be suitable. For example, surely some correlation with some figures of chiefs is expected to exist. This could be important for evacuations to better clarify the nature and attributions of Assertiveness.

i) Sub-dimensions and complementary aspects

It has to be noted that PDI, UAI and COLL have all both individualistic and community or group dimensions in both high and low Index values' ranges. For example, at high UAI values a sense of community normally exists, but when it is broken by the events a sort of uncoordinated individualism (panic) may start. At low UAI values both individualism and tendency to form spontaneously self-coordinated groups may exist. It seems also that the Low PDI, UAI and COLL fields cannot be adequately expressed by simply a low PDI, UAI or COLL index value. For example, achievement, in the Low UAI field, cannot be described as simply lack of no interest for money or similar. It corresponds in fact to a primary tendency, which may also be considered as conflicting with refusal of money. As another example, where the two tendencies are corresponding to refusal or achievement of a wife, lack of refusal is not corresponding to achievement. And, for a differentiation between patriarchy and

matriarchy, the second may not be simply explained as a lack of the first. For this reason the names Power Distance, Uncertainty Avoidance and Collectivism are quite misleading.
The same is found in the MAS dimension, where the femininity is just indicated as poverty of masculinity.
On these and other forms of sub-dimensions see for more detail Appendix 3.

III. – Some other applications

a) Interpretation of Data from Real Accidents
Once having prepared suitable classification schemes as above indicated, a meaningful but difficult check would be on the forms of behavior which can be reported from real accidents. On this subject see e.g. Dr Helen Muir (1994). The details therein contained on the individual response of passengers in an emergency situation would permit to attempt to anticipate a possible interpretation of at least some of them by the Hofstede's plots and tables.
Let's consider for instance high stress, high anxiety situations in aircraft accidents: in the above Hofstede's work (1991) they are clearly referred as more common in people having high UAI values character (see Table 5.2 in it), while on the other side the individualistic and achievement behaviors lead to more easiness in uncommon situations requiring spirit of adventure and individual initiative.
A characteristics which may be of the greatest importance in real evacuations is Panic. It may happen under high anxiety conditions, starting at the individual level for more sensitive personalities and developing within the mass of the passengers (see Appendix 6B point 1). This would happen e.g. in high UAI populations: considerations on collective panic made by representatives of high UAI countries, see the classical works of Canetti, Freud, are expected to be highly pertinent and explanatory of high UAI regimes.

From the available data on accidents (see Appendix 6A) we may cite the following best evidences.
On the Panic subject:
Case of Riyad, L1011 (all dead). An in-flight fire determined panic amongst passengers due to impossibility to get out.
Case of Manchester. A peoples' blockage in the aisle was reported as panic.
Case of Mexicana Airlines, (LOS ANGELES B727) (two heavily injured people). Overestimation of threat. The view of an engine discharge by night during taxiing gave the impression of a fire. Two persons seriously injured. A very similar accident, but with the aircraft stopped, occurred (O'HARE, B727): one person seriously injured.

What appears at first by these few cases is that the conclusions of Canetti (1960) are quite verified. In fact the greatest aspect favoring collective panic appears to be the impossibility to go out of the aircraft. In the case of Riyadh also fighting is mentioned, another confirm of Canetti's conclusions. Also a blockage, as in the Manchester case, would have led to panic, according to Canetti (however blockages may be caused also by inter-individual competition).

About the frequency of panic cases we may say that they are relatively few in survivable accidents. However collective panic is expected to be an almost normal condition in all cases of no escape possibility perspective, and a closer inquiry could reveal other cases of survivability where panic problems could have been better resolved. An evaluation of the cases

of paralysis as panic and their frequency may also increase the knowledge on panic cases concerning aircraft evacuations (see Appendix 6B).

b) Other possible research applications
The considerations till now developed may be applied to many fields concerning evacuation, for example as follows:
Modeling: determination and use of main human dimensions in simulations (see Appendix 7)
Construction: Anti-panic provisions for in-flight fire emergencies
Data collection: reference typologies. See also in Appendix 8.
Operational evacuations: basic knowledge on passengers' groups.

For other aspects, see the following.
Requirements: see in Appendix 2, point 3.
Panic and underestimation of threat (further considerations): see in the Appendix 6.

c) Methodological aspects
The above results suggest in turn a methodological application of the aspects connected to them (see Appendix 2).

IV. Conclusions

Man's reality may be much complicated and subject of discussions, therefore suitable effort effectiveness considerations are deemed necessary, together with a common determination to not favoring diverging discussions and to start being ready to consider any common aspects of human nature.
Within the above limits the examination of the IBM dimensions' characteristics reveals that, in addition to the dimensions or their fields, or aspects, already used in current evacuation experimentation (Assertiveness, Individualistic competition or cooperation) there are two further dimensions (Uncertainty Avoidance, Power Distance, or their complementary aspects) which present connections of primary importance with the reality of emergency evacuations, especially in high threat conditions, and depending on populations. Together with them also the High Index values' range of Collectivism has to be studied. They all have to be further studied for presence in them of different aspects, sub-dimensions, but in any case they appear quite promising and useful in anticipating future possible developments of research, in the main fields of accident data collection, evacuation operations, modeling, evacuation experiments, construction.

Appendix 1 - Original contributions of present research

The present Paper's content is based on an elaboration of previous works, mainly those of G. Hofstede and of C. Perrow. As it isn't always clear what is being changed by present considerations, a resume of those main changes is herein listed, as follows.

A. – As to Hofstede's work:

1. Primary reference to Collectivism instead than to Individualism (COLL = 100-IDV)
2. Determination of parallelism between PDI, UAI and COLL
3. Reference of PDI, UAI and COLL to kinship, of MAS to marriage ties
4. Synoptic graphic view of the four dimensions' index values determined by Hofstede, determination of Oriental, Latin and Germanic dimensional characteristics.
5. Specifications on Individualism and nuclear family
6. Extrapolation of Hofstede's Tables, and other Hofstede's data, to the Aircraft Emergency Evacuation context
7. Change from a more deterministic appearance ("software of the mind") to a double aspect (deterministic- statistic) framework. Consideration of sub-dimensions within the IBM Dimensions more than consideration of additional Dimensions of Practice. Need of a manifold methodological perspective (e.g. for High and Low PDI, UAI and COLL)
8. Enhancing normality and right perception of threat, right action.

B. – As to C. Perrow's work:

1. Extrapolation of C. Perrow's theory to the Aircraft Emergency Evacuation context
2. Parallelism between Perrow's dimensions and two Hofstede's dimensions
3. Potential addition of the other two Hofstede's dimensions to the Perrow's scheme

Appendix 2 - Considerations about Methodology

1. **General.**

The complete exposition of the methodology concerning the present essay is beyond essay's limits. However a list of the **most simple considerations about this Methodology** is as follows.

(a) **Need of being or becoming able to briefly understand and guide any kind of passengers.** We would need for example to have as much as possible a viewpoint suitable to any situation, as would be in an anthropological research. Or also, when we deem it more suitable, we should point out our own viewpoint, to permit an easier evaluation by the reader.

(b) Need to have a **viewpoint broader than that used in technical or regulatory considerations**. We need for example to have some familiarity with **Qualitative research**, a widely used methodology in the field of Anthropology (see also under point 3.1. below in this Appendix).

(c) Need to limit and focus as possible our subject, to **avoid the risk of degenerating into a too broad discussion**.

(d) Enhancing the no deviation aspects. **The right perception of threat, and obviously the right subsequent action, are the main reference point** (see also under point 2.1 below in this Appendix).

(e) Considering real aircraft accidents in addition to experimental evacuations. The last have strong built-in limitations which don't permit to reach or often even approach the reality of the **Extreme Conditions**

(f) **Considering theoretical aspects** in addition to experimentation, e.g. to interpret high threat real accidents. We have in fact a confluence of circumstances: that High PDI, UAI, COLL people act following principles or abstract viewpoints, and that in high threat conditions experiments are more difficult, and a more abstract kind of action is favored (see e.g. cases of depersonalization, H. Muir, 1994) .

(g) **Considerations preliminary to research.** The activity which led to the present essay may be considered preliminary to stating doing a commonly defined research. Research management activities may be similar. Considerations may be very broad.

(h) **Experience on qualitative considerations about systems.**

(i) Considering similar experience in non- aeronautical fields. For example, in civil evacuations (see e.g. Biasiotti, 1998) the difference between panic and under-estimation of threat appears with great evidence.

(j) **Use of different sub-methodologies** if necessary (e.g. "deterministic" for an authoritative regime, statistic when sufficient individual freedom is allowed).

(k) **The solutions are expected to be "familiar", even if they may be classified within different family schemes**. At least in the most ordinary cases they should give us the impression that they were already known, even if we were not able to recognize them fully.

(l) **Use of writing as a method of inquiry.** This may be an aspect of the qualitative research undertaken on which some more direct reference may be given (see N. Denzin et al., 1998), and is in fact a means used in the activities leading to present essay.

2. Dichotomies, alternatives

Let's call the differentiation between e.g. different forms of Power in a High PDI regime a Dichotomy (for example between Patriarchy and Matriarchy). Let's also call the difference between High and Low PDI, UAI and COLL ranges an Alternative. The most representative of those dimensions for these aspects of Dichotomy/Alternative if surely UAI, followed by PDI. A main defect of an Alternative starting to become a Dichotomy, may be that, even if we have the impression to cover with it all the aspects of the reality, in practice we are instead pushed towards an increasing dichotomization, that is further analysis. In other words we cannot proceed to perfection alternatives without deviating from our departure culture. The same is true if we try to excessively violate the "rigid" pole of an alternative. An example may be just on engineering: an excessive distinction between Dimensioning and Verification activities for social reasons might lead to excesses in both senses, if there wouldn't be the spirit of coherence of all engineers. And something similar may happen for evacuations: someone may think to have still a lot of chances, someone else may be terrified by the direct comparison with threat.

Let's see in more detail, but not too much, some other dichotomies or alternatives which appear the most interesting.

2.1 Validity-usefulness alternative. The correct estimation of threat

Starting from the need to furnish some information on the validity of the content of present essay, starting from the herein cited works (see also Appendix 3 below), we may first of all consider that the concept of Validity has its limits. Even in the most rigorous scientific thought we cannot speak about Validity only. D. Silverman (1993) refers that **in any discussion of rigor in scientific research the two central concepts are Validity and Reliability.**

The alternative between validity and reliability is much similar to the changes occurred after year 1870 in the field of economy, from classifying ideas as "right" or "wrong" to classifying them as "useful" or not (see D. Fusfeld, 1966). The initial position is quite evidently consistent with assuming the thought class "right" as referring most of all to National values.

Returning to the scientific aspects, the decision-making alternative between Deterministic and Statistic schemes (see also in Appendix 3, point 2.6.h.) is much similar to the above.

For the present essay a conclusion may be that what matters is not an abstract validity, or an agnostic usefulness, conflicting each other: what matters is the right vision of the evacuation aspects, and more directly a correct vision of the threat for the occupants of an aircraft involved in an accident. This will derive from an equilibrated consideration of all the aspects concerning the accident. <u>In fact an excess of usefulness would lead to underestimation of threat, and an excess of validity would lead to its overestimation.</u>

We may imagine the two extreme solutions, Validity and Usefulness, like two opposite deformations of the reality whose difference depends on the same deviating factor, to be located in the human, not in the physical dimension (see also under point 3.2. below).

A first possibility to have a right perception of threat would be then that of **not insisting in collecting and refining dichotomies in the human and cultural dimension,** in both the possible fields of the dichotomy, that of continuously avoiding "contamination" (see also below) and that of always "acting against (e.g. against abstract theory, purity)". At least for the evacuation aspects what is necessary is considering some viewpoint which is as much as possible free from this alternation, and as much as possible near to the physical "like-unlike" alternation.

The same way we may use them or something corresponding to interpret the reality of the evacuation errors (see also in Appendix 3, point 2.6.) and to try to find adequate solutions.
In this perspective we may try to anticipate the possible errors, not only in the Occupants, but also in the surrounding Organizations, Safety Culture, as acting more or less directly on Occupants' evacuations. In this perspective it makes sense to consider dichotomies, or the "contamination" pole of them.
The word "contamination" is taken from E. Berne, and is used here to distinguish it from a more normal integration or anyway interaction between the two poles of a dichotomy. On this subject we may say also that there are "deviations" in the sense above mentioned (see also below), which are fully normal, that is are characteristic of a certain culture. What is currently deemed abnormal is more correctly the further deviations from those normal deviations or configurations.
All the above however doesn't lead to preference for some kinds of populations with respect to others. Except for some influence on passengers, e.g. by briefings, availability of instruction material at airports, they have to be considered as a fixed Datum. What do we have then to do, with e.g. a High UAI crowd? We should use our knowledge to guide it conveniently, we cannot think to alter their usual mental paths instantly.

2.2. - Multicultural aspects

In the present Paper Multi-culture aspects have not been developed, as this may be a too complicated subject, where in addition decision-making would be difficult especially by Authorities. In fact the most common decision scheme in a "classic" meeting is to ignore cultural differences (see N. Adler, 1997, table 4-2). This case is not a random curiosity, but corresponds to the High UAI, PDI and possibly COLL ranges of values.
It was then deemed preferable to start with the case of single-country occupants, even if evidently not suitable to most of current cases.
In every case, as in some other cases listed above, we may distinguish two main ranges:

- one of Low PDI, UAI and COLL Index values, where we may effectively speak about Multi-culture aspects, as the scheme is pluralistic
- the other, of High PDI, UAI and COLL Index values, where the predetermined scheme is that of Mono-culture, or in other words Agreement of all on a single solution or cultural-organizational position. In this last case the real case scheme for aircraft evacuations is that of sudden standardization of everyone's conduct to the collectivity or community needs to have a safe evacuation, independently from the country of origin or Nationality of any occupant.

The integration scheme between Mono-cultural and Multi-cultural aspects might be that of current social organizations: the civil aspects tend to be multicultural, the military and high threat aspects mono-cultural.
We may think that, **proceeding in favor of right threat perception, we will have also a coordination between different cultures or sub-cultures, at least for that aspect.** In fact we will reach an agreement on it.

2.3. - Requirements, Advisory material

The Requirements and surrounding documentation would be more properly in the UAI dimension, in their double aspect, corresponding to High and Low UAI ranges. More specifically the following cases may be considered.
2.3.1. At low UAI ranges we have a tendency to deregulation, self-regulation and inductive rulemaking, that is on the basis of experience. The corresponding evacuation regime is based

on self-regulation of the occupants, with the aircraft crew applying a relatively moderate control, e.g. by Assertiveness. The corresponding form annexed to Requirements is Recommendation, Advice.
2.3.2. In high threat situations we should have first of all defined rules and procedures. The High UAI and PDI ranges would be the most suitable, and the regimes of evacuation should tend to realize similar features also with Low UAI, PDI and COLL people. In other words a sort of military regime should be realized especially when suitable people are involved. In rulemaking it is expected that the Nations who are in the High PDI, UAI and/or COLL ranges are making the most decided requests on requirements, procedures and low evacuation times.
2.3.3. In extreme conditions rules and procedures are expected to be not valid, as well as law. However it is known that training, e.g. of Firemen, may considerably increase the right perception of threat and the most suitable action even in extreme conditions. Volunteers' action has also to be suitably considered.

2.4. – Deductive theory and data

The part of the present paper dealing with application of the Perrow's theory is based on extrapolations. This is much in agreement with the fact **that at high threat levels there is no possibility to make experiments,** and even the collection of data may be much difficult. **Therefore in that field theoretical considerations like those on High PDI, UAI and COLL may be much suitable**. On the opposite at low threat levels, and at low PDI, UAI and COLL (especially UAI) values, the data collection is much suitable.
The fact is that often the field of experience is quite in conflict with the theoretical aspects. We haven't however to forget that the so-called theoretical aspects, in addition to appearing more suitable to high threat situations, are part of our recent history, as they may be referred to more rigid, heredity-oriented family structures.
In any case the **integration between theory and practice** appears to be one of the most fruitful, even in evacuations' study.
Another aspect of the distinction between theory and data, where with the word "theory" we are now meaning "a deductive theory" may be that of the "feedback / no feedback" dilemma, as often theoretical aspects are someway opposed to experience. Aspects of feedback are noticeably included in present methodology. It has however to be noted that, as a kind of extreme case, also aspects of no feedback need to be included. As an example, in High Threat situations there is no advantage for the person directly implied to consider experience feedback: if the case of survival is not resolved there won't be further occasion, where a feedback could be advantageous.

2.5. - The notion of Deviation

In Sociology the notion of Social Deviance is used. It was introduced in the sociological language for similarity with the statistical term Deviation (see L. Gallino, 1993).
In the case of Human Factors we may find speaking about Human Reliability (see e.g. Cox and Tait, 1991). Something similar should be better pointed out in psychology. For example, in the case of evacuations, speaking about deviation from a right threat perception, and from a correct action, would be coherent with what stated above. This deviation inherent to the evacuation aspects could be someway evaluated directly, but could also be correlated to current psychological and social deviations, for example violations and their opposites. This way it could be connected to Index values and dispersions like those of the IBM research. A partial criticism might be that the Statistic/Probabilistic scheme, like the Reliability cited above, should be located in the Low UAI and similar ranges.

In any case a more direct example of twofold deviation may be the fact, as pointed out by H. Muir (1994), that in real evacuations some passengers travel for considerable distances along the cabin, missing to being attracted by their nearest available door, while other passengers apparently near exits do not survive. A partial "dualistic" interpretation might be that, while some passengers are driven mostly by avoidance tendencies, others would be attracted too much by the nearest exit. The "normal" action would instead be that driven by a proper balance between avoidance and attraction tendencies.

3. Further considerations concerning methodology

3.1. - Mental modeling and Qualitative Research

A direct derivation of the above considerations on the double aspects in the fields of society and psychology is that the first and more important modeling activity is that which we may build in our mind, or better in our mind-body system. In fact it may be difficult to express in a single physical model both the aspects of High and Low PDI, UAI and COLL, especially when they are quite conflicting. See however also under Appendix 7. on Modeling.

For this and other similar aspects, which may concern what is currently called Qualitative research (see Ricolfi L., 1977, and also Denzin et al., 1998, Silverman, 1993, Maxwell, 1996), it is important that the methodological aspects of our present research are described. It is also a characteristic of the Qualitative research the need of a thorough experience and knowledge on such practices to have satisfactory results. For the same reasons this paper may present some difficulty to be understood, especially by people who don't have any experience on qualitative research. However to be coherent with our aims of coordination we won't like the Qualitative research only, but its coordination with the Quantitative research. The relationship between them may be manifold. We might e.g. try to think that Quantity, in the case of Social Sciences, represents something abstract and impersonal, due to use a specimen equal for all. But in fact it is clear that, if we assume that Man is the reference measure, with this we already mean something much less abstract than an extra-precise physical measurement specimen. In this sense, and comparing the above distinction between qualitative and quantitative research to the High and Low PDI, UAI and COLL fields, we may think that there may be a Qualitative research covering both those fields. From the fact then that even scientific evaluations may be distinguished according to the two fields above, see under point 2.1. of this Appendix, we may then think that, in some suitable way, our Qualitative considerations may often be converted into Quantitative evaluations as well, or vice versa, depending on the desired priority.

3.2. – Mind model

When we speak about Mental modeling we are speaking mostly about some sort of modeling by our thought, while when we need to construct some model of the passengers we speak about a model of their mind. In fact there must be some high correspondence between the two. In any case let's try to construct a model of Man on the basis of Hofstede's dimensions and fields. In this perspective a very simple, physical passengers' mind model may be: something capable of liking and disliking. In this we may distinguish a very strong natural set, corresponding for example to physical exigencies: fire, smoke, exits. But, put over it, there may be another way of liking and disliking, loving and hating, that implying the relationship with the surrounding people. It is very strong too. And the two sub-models are using to a great extent similar faculties of the mind. For example there is something similar in disliking a temperature and hating a person, the elementary category is the same: disliking, trying to avoid or to annul. The two sub-models may then someway interact: when the second sub-model

effect is beyond that of the normal cultural aspects a crash may be interpreted as a severe punishment, or a destruction of all on which one did believe. We may then think that, concerning the second sub-model, severe "contamination" or attempt to decontamination of our mind may alter our relationship with the physical environment. For the aspects of evacuation this may be called a deviation from what is physically expected as the optimum to perform a safe evacuation.
This mind model would also open the way to parallels between deviations during evacuations and the experience of psychopathologists. For the same reason the experience of "mind doctors" as the psychoanalysts is also suitable. Let's not forget that at present we are quite able to consider physical injuries, but there is no evident sign of considering psychical traumas by accident reporters, and even less by Authorities. If we would be able to resume all these aspects and information into a mind model the advantages, e.g. for computerized evacuation modeling, could be great. Of course the subject is important. Some main reference in the literature concerning this subject is e.g. the work of P. Johnson-Laird (1983). In it he distinguishes briefly between physical and conceptual models, which would tend to confirm the above assumptions.

3.3. – Sexuality and marriage

Although not corresponding to the above dichotomizations, the differentiation between High and Low Masculinity is still a sort of differentiation. It may be in general much important, but in fact in the present work it has been examined very few, and in a not systematic way. This fact depends mainly on the following reason: the main tendency of present work is to extend the field of current experimentation and considerations to the Extreme Conditions' field. And what is expected as suitable for this field is kinds of conduction and actions during evacuations suitable to the High PDI, UAI and COLL values' ranges, or in any case similar to them for those people who in reference normal conditions would be classified in the Low PDI, UAI and COLL values' ranges. In every case in Extreme Conditions it is expected that aspects connected to sex, or MAS, like positive interest for money, assertiveness and even a certain kind of fighting, at least assume a secondary relevance. In fact simply the circumstances are not suitable to the development of such aspects, and everyone has others to think. More scientifically, to the High COLL range would correspond many kinds of taboo, sexual included. The High PDI and UAI ranges shouldn't be much different. In this perspective what is normally understood as sexuality and marriage should be located as possible development in the Low PDI, UAI and COLL ranges. Speaking about evacuation regimes the presence of nuclear families within the passengers would be an element in favor of more use of Low PDI, UAI and COLL regimes, when allowed by not extreme conditions. Extreme conditions would instead not be in agreement with e.g. use of assertiveness, use of money incentives during evacuation tests.

3.4. – Headship

For example the **alternatives** examined above haven't in fact a simple solution, because, at least in part, one of their poles tends to increase the distinction between them, and the other to oppose the same distinction. In other words the first is analytic, and the second synthetic. But the last doesn't represent an intermediate position, and doesn't lead to it. For example underestimation during evacuations is not an intermediate position. In other words, especially when the dichotomy or alternative is strong, it isn't possible to find a satisfactory intermediate solution. One of the ways to search for effective coordination is then to evaluate the Chief's viewpoint, or possibly better the viewpoint of some kinds of Chiefs. The figure of the Chiefs is missing or examined under the perspective of employment in Hofstede's work. However,

although there may be a series of intermediate cases, the consideration of supreme Headship is one of the subjects beyond the limits of present essay. A reply to use the individual as coordinator might be that it depends on which individual: in fact the individuals, statistically speaking, have to be located in the Low UAI range and similar.

3.5. - Volunteering

We may however hint to other aspects, which, like the figure of the Chief, are beyond the optics of salary: for example the Volunteer's figure. Risking own life only for hire in extreme condition is not at all an advantageous business. It may also be added that in those conditions also laws, and even more requirements and procedures, might have no validity. To make an example, just in UK, which from the Hofstede's PDI-UAI graph is located in the "village market" quadrant, are known to exist groups of professional volunteers who, with little or no compensation, risk their life to save people on sea or in fires. That of volunteering would be a case where procedures for normal employees wouldn't be effective, but evidently concerns Safety. It's a good point for further meditation on it.

Appendix 3 – Suitability of reference works, and further notes

This Appendix resumes notes on Validity/Reliability of other authors' works in spite of the attempt to extend them to the specific case of aircraft evacuations.

1.- A list concerning Hofstede's work suitability to the subject of aircraft evacuations is as follows.

1.1. Hofstede's National/Organizational characteristics - Sub-dimensions

A direct reference to the main aspects of the original questionnaire appears as preferable for the evacuation aspects. In addition a distinction of many kinds of headship in each PDI range of values, and probably of corresponding regimes for UAI, is possible, and suitable to the detail evacuation needs.

1.2. Kinds of anxiety

Distinction of many kinds of anxiety may be parallel to the distinction between PDI, UAI and COLL, for the similarities existing between these three dimensions, and between their High and Low Index ranges. Within the UAI dimension G. C. Cocco (1993) refers on two different kinds of anxiety: one referring to the Certainty area as persecutory anxiety, and the other referring to the Uncertainty area as anxiety of being abandoned.

1.3. Distinction between anxiety (neurosis) and psychoses.

The Low UAI regime is indicated, in different places (Hofstede, 1991), both as corresponding to a healthy anxiety-free state and to psychoses, more specifically those corresponding to lack of sensitivity of the person. There is no indication of correspondence of psychoses to Low PDI only. In addition the relationship with parents appears the most suitable to the PDI dimension. A hypothesis is that this relationship, and therefore the PDI dimension, would concern the most deep psychological impressions.

1.4. No extreme need of re-clustering for Evacuations

Development in agreement with Hofstede's research: the Dimensions appear as corresponding to few main forms of relationships within family.

1.5. Applicability of Hofstede's IBM Index Values to Evacuations

Index values collected in the IBM research may be a valuable first approximation for evacuation aspects. However cases like headship in extreme conditions, volunteering, cannot obviously correspond to data collected on factory employees.

1.6. Validity of the Dimensions as measurable kinds

Two kinds of measures should be determined for High and Low Index range values, for example: deterministic and statistic respectively. However, as much as feasible, only the statistic kind of measurement will be considered for both. This may lead or have led to some trouble when used for "deterministic" social regimes. See also on Sub-dimensions, point 1.1. above.

1.7. Divergence in the Tables

The need to make Tables with defined extreme characteristics would increase the difficulty to find the right perception of threat, especially for an unbalance in the sense of an excess of Analysis. On the other side this would be for the moment an indication in favor of accepting

the four Dimensions described in the IBM research without need of further Dimensions of Practice.

1.8. Hofstede's Types of Human Survival.

With respect to PDI, UAI and COLL Index Values' ranges Survival would be more properly that in the High Index Values' ranges, e.g. Collectivity and Community survival. It would concern a system of power and taboo to control resources, not only those based on agriculture. That in the Low PDI, UAI and COLL range would instead be more properly individualistic growth, achievement. Similar considerations may be found in Okonji (1980), citing Witkin and Berry (1975).

1.9. COLL

Aspects of COLL in its both main values' ranges should be better clarified. More than in the case of the other dimensions, UAI and PDI, they could concern with more suitability the relationship with the natural resources (survival or incorporation; defense or use), and therefore with the evacuation scenario. In fact UAI and PDI would be primarily directed against the human adversities.

1.10. MAS

For the aircraft occupants it would be important mostly for low and medium threat regimes, however its further implications, for example with some forms of headship, should be better clarified.

1.11. East/West

There may be many differences between Eastern and Western values which cannot be reduced to differences in Index values of the four Dimensions. For example we may expect some differences in the forms of Power, which could constitute a further detail on PDI sub-dimensions. And we note the very different definition of Chinese masculinity (see in Hofstede, 1991, about the Chinese Values Survey).

In any case the China Values Survey (CVS) research (cited by Hofstede, 1991) confirms Hofstede's assumptions concerning the existence and influence of different kinds of simple elementary family relationship (e.g. father-son, brother-brother).

1.12. Dichotomies

Hofstede's distinctions between Low and High PDI, UAI and COLL characteristics may lead to enhance National Values' aspects. See also in Appendix 2.

1.13. Individualism and Nationality

This aspect is better developed in Appendix 4 below.

2. A list considering <u>other authors and subjects</u> is as follows.

2.1. C. Perrow's theory and IBM dimensions

At present the C. Perrow's theory (1984, resumed in 1986) is first of all an easy term of comparison. Further analysis and research concerning more specifically all four IBM Dimensions, and possibly also sub-Dimensions, applied to Evacuations is necessary.

A note on Perrow's theory is that of Turner (1992), who, as cited in Pidgeon et al. (1994), sees Perrow's work as excessively schematic. Surely there are elements in Turner's criticism

which are in agreement with the content of present essay. Although the viewpoint of present essay may be situated not decidedly on behavioral or on meaning aspects, and although the present essay is addressing towards evolutions more consistent with Perrow's theory, the study of the organizational Safety Culture referred on by Pidgeon et al. (1994) is at present attractive but beyond the limits of present essay.

2.2. Applicability of Kinship schemes to the Passengers

The present Paper's analysis is considering the Passengers as being part of the aircraft Occupants, as for example could be for the employees of a certain kind of Firm. This may correspond to a sense of unity between the Aircraft occupants. However in fact the aircraft and its Crew only are part of an Airline Firm. And this Firm is in turn client of the Constructor firm. Therefore, despite the necessary sense of human unity within an aircraft (all are going to possibly front the same threat) the preliminary framework is in fact different. This may be a point of discussion which has to be kept in due account, for example for the fact that different Airlines may deal differently with their clients.

2.3. Validity of the Family scheme effectiveness

Let's make some considerations on the Family scheme effects. In the countries owing to the Germanic family of language the original form of family was the Stem Family, whose characteristic was undivided heredity to only one of the sons in a family. In the Latin ones on the other side there was equally divided heredity between male sons. Surprisingly, the first did develop large flocks of free individuals not favorable to imposed authority and hierarchies, even if still rooted on differentiated personal property, and the second a system of social classes.

The scheme of the Stem Family should be already an indication in favor of the importance of the vertical, intergenerational ties. Another indication in this sense may be the fact that in the kinship terms concerning the old Saxon families there were single composite names indicating the tight coupling or the reciprocal identification between father and son, or between maternal uncle and nephew (see Guichard P. and Cuvillier J.P., 1986).

On these bases we may then suppose that in the old Saxon families the vertical kinship ties were much important. Today, after the interaction with the Industrial Revolution, the Nuclear Family is the norm, and, as the Hofstede's Tables on PDI indicate, where there may be some form of Power this is at least not pointed out.

We may then summarize saying that the undivided heredity to the group of the brothers may explain the frequency of High UAI in the Latin Culture countries, and that today's situation of the Anglo-Saxon culture people is a derivation of an older culture where probably PDI values were higher than today. Another differential aspect between Latin and Anglo-Saxon culture on the basis of the family structures is that the Latin culture gives more importance to the brotherhood ties than to the heredity objects, which risk to become too much fragmented, while the Anglo-Saxon culture gives more importance to the heredity objects than to the brotherhood ties.

All these notes appear as giving indications in favor of the validity of the family schemes as explanatory of many fundamental characteristics of today's life.

There are on the other side considerations at the psychological level which show that for the single case the precocious experiences are not fundamental for the further development of the personality (see R. McHenry, 1986). However we may probably better say that there is a general correspondence between the aspects of a culture and children's' education in their families as a whole.

2.4. Anthropological considerations

A view in the field of anthropology would furnish the best means to further validate the subject Dimensions. Much of the "qualitative research" reasoning used in the present essay derives from there. In fact this form of reasoning is more usual in anthropological matters (see Ricolfi, 1997). However the subject of Anthropology would broaden excessively the field of research and its exposition, conflicting also with the main purpose of this essay, that to be adherent as much as possible to the Aircraft Evacuation subject. Therefore, even if Hofstede's work is quite extensively referring to anthropological aspects, and even if sometimes in the present essay also the reference to anthropological aspects is quite unavoidable, it has to be considered that the exposition on the subject has been forcedly limited.

A feasible anthropological consideration may be in any case on the basis of J. Goody's work (1983), referring that in Europe there was the passage from a Bifurcate Collateral kinship (and marriage) structure to a neolocal structure. In it the Bifurcation may be referred to UAI aspects, and the Stem family to additional PDI aspects.

2.5. Psychological typologies

The characteristics of the main Questions (see table 2 in Appendix 4) for UAI seem to correspond quite well to the physiological characteristics of the Schizotimic character reported by Hofstaetter, 1957, citing the German psychologist Kretschmer (1921). Although this character was found correlated to the physical configuration with not full evidence, a similar correlation was more recently confirmed by Parnell (cited in Harrè and Lamb, item Constitutional, Psychology). What is interesting here however is not the connection to the physical constitution, but the reduction to psychological types.

The subject of typologies is interesting, e.g.. for modeling. On typologies it is opportune then to indicate a possible way for a greater generalization, on the basis of IBM data, as follows:

- the four IBM dimensions would be a basis for typological distinctions
- a partial basis for typological distinction would be on High PDI, UAI and COLL characteristics. A proposal for an interpretation of current considerations on typology may be that Low PDI, UAI and COLL features would refer to single individuals more than to categories of people. This would happen also because individualists like to differentiate each other individually.

2.6. Other confirms, similar works, possible extensions

a. See also the works resumed by Okonji (1980). He is citing Witkin H. A. (see e.g. 1965) and other authors about the distinction between an articulated cognitive style, associated with a more developed sense of separate identity, field-independent, more competent in cognitive analysis and restructuring, and a global cognitive style, associated with a closer reliance on social environment, field-dependence. Okonji is also citing Cohen (1969), who proposes that the two main characteristics of field-independence and field-dependence are associated to being brought up in a shared-function family (a communistic family system) or in a "formal-function" family (characteristic of industrial western societies) respectively. Okonji is also citing a social anthropologist, Pelto (1968), for his distinction between hierarchical, tight social arrangements, associated with predominance of a field-dependent cognitive style among members of the society, and loose social arrangements, associated with predominance of a field-independent cognitive style. It is quite clear that these distinctions are much similar to those described by Hofstede for PDI, UAI and COLL.

b. The works of the psychoanalyst Eric Berne, the founder of the Transactional Analysis, (see F. Ricardi, 1997) have features like: distinction between Ego states (Parent, Adult,

Child), interpersonal interactions as interactions between these states, barriers or intermixing (contamination) between different states in a single person, which have undoubtedly some similarity with the IBM Dimensions' whole.

c. A. Cardon (1992) on the basis of the notions of Limits and Centralization and with familiarity to the Transactional Analysis did find an organizational scheme which is probably theoretically more suitable than that of Mintzberg.

d. A work quite similar to that of Hofstede is that of Trompenaars (see e.g. 1993), a his follower.

e. Some reference to Anthropological aspects seems unavoidable, and for this aspect we may cite the work of G. P. Murdock on the different kinds of social structure in relationship with elementary features (1949). Although it may not be explained here, it may be considered a far departure point of present considerations.

f. The D. Kolb's Learning Cycle (see e.g. D. Kolb et al., 1979; B. Carlsson et al., 1976) is noticeable because it may represent a sort of dynamic integration means between the two opposite Abstract and Concrete (individualistic) poles.

g. The **Rasmussen** theory on Errors (see e.g. Reason, 1990) appears quite parallel to the IBM "kinship" dimensions (PDI, UAI and COLL): in fact the correspondence of the Rule-based errors, in addition distinguished between "wrong application of good rules" and "application of bad rules", with the UAI Dimension appears quite evident. Knowledge errors would correspond to PDI (there is also an intellectual Power Distance). In the COLL dimension there are hints to Skill.

h. Another note is that the consideration of any kind of human errors, e.g. not only those around perfection, may give us occasion to further thoughts on a certain kind of scientificity and right vision of the reality.

i. Decision Making. Even Decision Making models (see e.g. Cooke and Slack, 1991, page 151) may be referred to the different PDI and UAI ranges: the Determinism / Statistics alternative would correspond to High and Low UAI ranges of values respectively, and the Optimization (One Best Solution) / Many Partially Satisfactory Solutions alternative would correspond to the High and Low PDI alternative respectively. This would be an indication more in favor of the thesis that High PDI is still deep-rooted in Western countries, despite the diffused individualistic appearance in the "masses" of some of them. In Perrow's theory it appears e.g. as "tight coupling" between superior and subordinate. Decision making is also much important in considering the Multi-culture / mono-culture alternative (see point 7. above). Please note, about the Determinism/Statistics alternative, that in the Statistic/Probabilistic range we find again the individuals, and the populations of individuals, while in the Deterministic alternative we would find a sort of scission to follow only one part of the reality.

j. C.B. Handy (1976) (cited in M. Decastri, 1984) in his typology on organizations distinguishes among others between Organizational cultures of Role, Power and Task.

Appendix 4 – Comparison between Hofstede Tables, and between some IBM dimensions

Let's now make a more systematic and interactive comparison concerning Hofstede's Tables.
Hofstede's work main aspects may be resumed as follows:
Tables in H. (1980) corresponding more strictly to the Questionnaire
Tables in H. (1991) corresponding in large amount to results of inductive considerations departing from the questionnaire and leading to National Values or similar, together with the fact that a research on Practical Aspects instead than on National Values was also started by Hofstede.

Considerations of the Author are referring to the Questionnaire as much as possible, especially Questions in it which were found by Hofstede the most relevant (see **Table 2** below). This is also much in agreement with the main methodological assumption of present essay, that is, to limit and concentrate as much as possible the efforts of the research on aircraft evacuations.
However the Tables in Hofstede (1991), including all the characteristics of the Dimensions obtained by inductive extrapolations, are also used, as a reciprocal comparison between Dimensions was found easier with them. Three of the Dimensions, those which are expected to refer to kinship aspects, were elaborated from the original Hofstede's Tables to facilitate a direct comparison between them. The result (see **Tab. 1** below) was the confirm that they have something similar, even with some other reciprocal differences. At this point we have to resolve a problem: why these similarities, if Hofstede's research did confirm the above COLL, UAI and PDI as independent variables?
A first temporary reply may be that they would have the same nature, but not the same specific reference. For example, we may have the same kind of relationship, let's consider reciprocal identification:
- between father and son
- between brother and brother

A more specific result was the confirm that, with the above order of differences, High COLL, and not Low COLL (high Individualism) was the one directly correlated to forms similar to Nationalism.

TAB. 1 – Comparison between COLL, UAI and PDI from Hofstede's Tables (1991)

	High COLL	Low COLL (High IDV)	High UAI	Low UAI	High PDI	Low PDI
Family	Extended family "We" terms of children learning	Nuclear family "I" terms of children learning	Tight rules for children on what is dirty	Lenient rules for children on what is dirty	Relevant role of the father Obedience of children towards parents	No relevant role of the father Equality of children towards parents
School	Education to action School Diplomas have effect on status	Education to learning School Diplomas have effect on economy	Determined, teached answers Ended discussion	Discussion Open ended discussion	Personal wisdom by teachers Respect of students towards teachers	(Impersonal truth) by teachers Equality of students towards teachers
Work	"Extended family" in employer / employee relationship Employee's in-group is important in hiring and promotion Collectivity prevalence in management Prevalence of identification relationships'	Individual contract in employer / employee relationship Skill, rules are important in hiring and promotion Individual prevalence in management Tasks' (or Jobs', Contracts') prevalence	Specialists Doctors Work hard	Generalists Nurses Lazy	Centrality Command (top-down) Good father role of the boss Status symbols for managers Managers' focus of native management theories.	Decentralization Consultation of the subordinates (bottom up) Democrat role of the boss No status symbols for managers Employees' focus of native management theories.
Ideas	Collectivity prevalence Predetermined opinions <u>Equality</u>, no freedom ideologies (within the collectivity)	Privacy prevalence Private opinions Freedom ideologies	Absolutism Absolute truth Grand theories Extremism Conservatism, resistance towards innovation Persecution for personal beliefs	Relativism, *tendency to liaisons* Relative truth Empiricism Tolerance Tolerance towards innovation No persecution for personal beliefs	Desire for inequalities	Minimization of inequalities

(continued)	High COLL	Low COLL (High IDV)	High UAI	Low UAI	High PDI	Low PDI
General norm	Collective identity Collective harmony Loss of face for trespassing High communication context	Individual identity harmony within the individual, self actualization Loss of self-respect for trespassing Low communication context	Common risks (to pass the limits) are accepted *Great life losses in battle* True Within limits Within time limits Spontaneous precision and punctuality No discussion on rules No acceptance of what is different Certainty, refusal No tolerance of ambiguity	Uncommon (individual) risks are accepted *Small life losses in battle* False Out of limits Out of time limits Not spontaneous precision and punctuality Discussion on rules Acceptance of what is different Achievement Tolerance of ambiguity	Impressive behavior of powerful people. Desired inequalities among people Dependence among people	Not impressive behavior of powerful people. Minimized inequalities among people Interdependence among people
Politics	Dominant role of the collectivity Collective interests in economy Interest collectivities exert political power Collectivity controlled press Low GNP	Restrained role of the collectivity Individual interests in economy Voters exert political power Free press High GNP	Nationalism Repression of minorities Precise laws and rules	Internationalism Integration of minorities Not precise, flexible laws and rules	Autocratic government Co-optation Violence Revolution Strong wings Power struggle political ideologies Stratification	Pluralist government Voting No violence (Evolution) Strong center Power sharing political ideologies No stratification

Added from Hofstede's (1980) Tables			*Faster car-driving admitted and more fatal road accidents.*	*Lower speed limits and fewer fatal road accidents*		

TAB. 2 – Hofstede's main Questions for COLL, UAI, PDI

	High COLL	Low COLL	High UAI	Low UAI	High PDI	Low PDI
Hofstede's main questions	Training: have training opportunities (to improve your skills or learn your skills). Physical conditions: have good physical working conditions (good ventilation and lighting, adequate work space, etc). Use of skills: fully use your skills and abilities on the job.	Personal time: have a job which leaves you sufficient time for your personal family life. Freedom: have considerable freedom to adopt your own approach to the job. Challenge: have challenging work to do – work from which you can achieve a personal sense of accomplishment.	Job Stress: How often do you feel nervous or tense at work? (often). Rule Orientation: Agreement with the statement: Company rules should not be broken – even when the employee thinks it is the company's best interest. How long do you think you will continue working for IBM? (Long time).	(Same question. No often) (Same question. The rules should be broken) (Same question. Short time)	How frequently, in your experience, does the following problem occur: employees being afraid to express disagreement with their managers? Frequently. Subordinates' preference for their boss's actual decision-making style: autocratic or paternalistic, or on the contrary, based on majority vote	Subordinates' preference for their boss's actual decision-making style: consultative style.

Appendix 5- Considerations concerning current experimentation.

1. - Background on current experimentation

The first experiments on evacuation were made on the basis of an individualistic competitive behavior (Muir H. et al., 1989). Recently an experimentation based on cooperation between the passengers has been also introduced (Muir H. et al., 1996). Both were based on money reward as main direct motivation to occupants' action. On this subject see also H. Muir (1994).

2. - Additional considerations

The real evacuation cases are expected to be dominated by the tendency to avoidance (e.g. fire, water) more than by tendency to achievement (e.g. exit, personal belongings), even if the two main aspects, avoiding danger sources and gaining the exit, may also be not conflicting each other. However we may forecast, for possible future experimental developments, that at low threat levels achievement aspects will prevail, and at high threat levels avoidance aspects will be almost fully dominating.

Interpreting current research and test methodology as Benchmark, as defined in the recent International Conference on VLTA (1998) (see the Paper "Workshop Recommendations – Occupant Safety"), would imply the need to define the aspects of it, e.g.: reference Occupants' population, first of all.

In every case, irrespective of the Benchmark position, or also starting from it, many other kinds of experimentation involving human beings in evacuation may be developed, e.g. referring directly to Operations, as pointed out in the above Recommendations. Surely the public will favor those who are taking more care of them, although depending on the information they may receive on the subject.

3. - Applications of Hofstede's data to the current experimentation on evacuation. Our more direct reference in the present Appendix are first of all Individual Competition, Individual Cooperation and Assertiveness, as current subjects of experimentation on evacuation (H. Muir et al., 1989, 1996).

Let's try to apply directly the content of Table 2 in Appendix 4A above (main original questions on PDI, UAI and COLL), and the MAS characteristics.

i. - Competition between individuals

Individual Competition was the departure point, see CAA Paper 95006 part A. This could easily be compared to the dimension MAS, for the presence of two its characteristics: the use of individual money reward as motivational protocol and the tendency to fighting out difficulties. It is probably for this reason that Assertiveness of the Cabin Crew, another MAS characteristics, is effective in coordinating the evacuation flow. In fact in that case it would be a specific.

This is compatible with a participants' character of Low COLL, UAI, and PDI as it may be presumed were the test conditions.

ii. – Cooperation between individuals

In a situation as that in current evacuation tests:

- we have the case of headship comparable to a "consultative manager" conduction style, that is in a regime of low PDI.

- There is some hint to cooperation for low MAS. In its three possible plots, with IDV, UAI and PDI, the MAS dimension has constantly the effect to divide the countries usually indicated as "individualistic" in two groups, one competitive and the other more in agreement with cooperation. See e.g. the plot PDI - MAS of Fig. 4.2, Hofstede 1991.
- In the High IDV range cooperation is still possible, for example as mutual advantage on the basis of contracts.

Another kind of cooperation would be possible at high COLL, UAI or PDI regimes, and which would be more near to the concept of survival in the strict sense. The cases would be as follows:
- Cooperation is cited in Collectivism, the complementary of IDV (see table 3.3 in Hofstede, 1991),
- In the UAI dimension we could note the possibility of some "rule of the group" for UAI
- In high PDI regimes we have cooperation as effect of coordination by the empowered person.

Therefore, in agreement also with the main kinds of survival behavior (see Appendix 3), we may say that a group may have two main types of cooperative behavior:
- one which we could call Individualistic- Cooperative, and which would correspond to high IDV, low UAI and PDI. It would happen better with a low MAS population, but even the case of High MAS would be someway possible. This would be based on mutual advantage in individualistic situations.
- a second based on High COLL, UAI, PDI.

On the basis of the same Hofstede's Tables (1991) we may conclude that all are not emphasizing money, unlike the Individualistic-Competitive people, for the presence of High MAS index values. We may conclude on this fact that money reward is very suitable to promote Individualistic- Competitive behavior, but could be not so adequate to primarily promote and test all varieties of cooperation, especially that based on High PDI and UAI values.

The so-called Individualistic countries at the social and political level have specific forms of cooperative behavior, like the tendency to form Constitutions, or the so-called Queuing behavior, a spontaneous tendency to alignment in queues. Characteristic of the USA would be the so-called Structured Individualism (see R.D. Lewis, 1996).

iii. Use of questionnaires

Questionnaires on the example of those used by Hofstede may be used with the occasion of evacuation tests, to ascertain the typological characterization of the participants, and therefore to possibly state a connection of it with the evacuation results.

iv. - Hesitation

Hesitation before jumping on an evacuation slide should depend greatly on the stress level, and on the phobic character of a person. It should be correlated, in terms of frequency, to the UAI mean value of a Country, but of course further experimentation and considerations would furnish more specific knowledge on the matters.

4. Conclusions

We may then conclude that, at least on a theoretical basis, current experiments involving cooperation and competition are concerning mostly the MAS dimension, together with Low COLL, UAI and PDI. This may also be expressed in terms of kinds of survival, see App. 3. In other words, current experiments do not keep enough into account all Dimensional aspects, and, most of all, their different fields. Use of proper Questionnaires on Hofstede's example is opportune. Cases like Hesitation may be much sensitive to typological considerations.

Appendix 6 – Considerations and data on panic and similar phenomena

A. - Elaboration on Panic data

Of about 100 cases thoroughly described in the R.G.W. Cherry (1998) Database, only 15 include comments on panic. They are the following (the code number identifies the date of the accident).

940302A (NEW YORK MD82)
930914A (WARSAW A320)
921127A (O'HARE B727)
890719A (SIOUX CITY DC10)
880626B (HABSHEIM A320)
870531A (LOS ANGELES B727)
850822A (MANCHESTER B727)
840322A (CALGARY B737)
830723A (GIMLI B727)
830602A (CINCINNATI DC9)
880819A (RIYADH L1011)
790731A (SHETLAND 748)
780626A (TORONTO DC9)
721220A (CHICAGO DC9)
690113A (SANTA MONICA BAY DC8)

A short resume from the above list of the significant happenings concerning Panic is the following.

940302A (NEW YORK MD82)
No fire. A passenger yelled "stay calm, don't panic". Flight attendants inert. Aircraft in nose down position. Not relevant for panic.

930914A (WARSAW A320)
Fire on broken left wing. Unquestionable role of Flight attendants in preventing panic.

921127A (O'HARE B727)
Overestimation of threat. Panic induced by APU exhaust during parking. One passenger seriously injured.

880626B (HABSHEIM A320)
Fire from broken right wing penetrated the cabin. **Panicking** passengers pushed in the front of the cabin. A hostess left the aircraft. Three passengers succumbed to fire.

870531A (LOS ANGELES B727)
Two passengers hanging on to the left wing. Complete panicking due to overestimation of threat (APU exhaust by night). Mexicana Airlines. Two persons seriously injured (153 occupants)

850822A (MANCHESTER B737)
Fire on the left side of the aircraft. **Panic** with passengers' fight. 54 occupants expired.

840322A (CALGARY B737)
No panic.

830723A (GIMLI B727)
Aircraft gliding without fuel. No relevant to panic.

800819A (RIYADH L1011)

In-flight fire. All dead. Complete panic.
790731A (SHETLAND 748)
Water from over-wing exit. Near panic amongst some of the passengers.
721220A (CHICAGO DC9)
Flames around the aft section of the fuselage. Very little panic.
690113A (SANTA MONICA BAY DC8)
A moment of panic. Drowning.

B. - Psychological considerations on Panic.

1. Resume on panic in groups

From A. Callegari (1998) the following notes on collective panic which may be extrapolated to aircraft evacuations are inferred:

Forms of panic manifestations: **paralysis** (when movement is not possible, especially for single individuals), uncontrolled **escape**, disordered **excitation**, blind **violence**. The most characteristic is the savage escape.

Conditions favorable to panic control in a group: knowledge on group reactions, prevention and preventive information, existence of a recognized chief, low number of panic sensitive individuals in the group, low group heterogeneity, low group promiscuity in a crowding situation in a small space, invitation to calmness and obedience, recall to the values of responsibility, solidarity, cohesion.

On group heterogeneity it is worth to cite a work of C. Kovach on the productivity of 4-6 students' problem-solving teams (cited by N. Adler, 1997, Fig. 5-3): it appears that heterogeneous groups in normal activities may be either more or less efficient than homogeneous groups.

2. Some notes on crowd psychology theories

From M. Gergoudi and S. Moscovici in Harrè Lamb (1983) item "Folla, psicologia della" (Crowd, psychology of) we find that the theory of the Crowd Crystals proposed by Canetti (1962) was verified in the New York streets by Milgram (1969). Something similar is said in the theory of the "Emerging rule" by Turner-Killian (1957). All these aspects appear as in agreement with what reported by Callegari (1998), on the genesis of collective panic from few individuals subject to individual panic attacks, and also on what reported by H. Muir (1994) about the reduced number of people displaying responses akin to uncontrollable panic. This enforces also the thought that an efficacious headship may be valuable in preventing or resolving incipient collective panic attacks generated by single more sensitive people.

3. Some less recent theories on crowd panic.

Let's take a view on the Hofstede's Dimensions to better understand panic. The dimension UAI is not referred by Hofstede as directly related to survival. In fact it is in direct relationship with a tendency to heavy life losses in wars and battles. Its meaning for the survival would then be not directly connected to the individual, and, at the extreme, would more properly concern the survival of a community-like structure, very often through the sacrifice of a part of the Community. In other words, the survival aspect inherent to UAI might be Survival of the Community. At the anthropological level the above extreme position would be true especially in contraposition to a rival community, therefore the derivations at the level of emergency evacuation are to be studied.

In every case the above identification with the community would also indicate a possible way for anxiety reduction. At this time a note is opportune: such extremes are quite theoretical in

the contemporary civil life, however we haven't to forget that even the conditions generated by an accident fire are extreme. In those conditions it is true that panic would be normal, but it is even true that uncommon personalities are the most sensitive people, and act as starters of the collective panic.
Conversely, and at a more psychological level, uncommon or not forecasted nor programmed risks, as well as risks on an individualistic basis, are avoided.
On the basis of the above we might derive that Anxiety and similar phenomena would correspond to the negative aspect of a collective aggression, that is, the case where the aggression coming from the external tends to fragment the community's solidarity and to undermine members' common beliefs. On this point a good correspondence point is what S. Freud (1921) refers on coming of panic in military troops during battles: it would correspond to the destruction of the internal ties of the squad.
It is the case to add that, in terms of taboos, the unity of the occupants' community would be maintained until collective taboos, or rules, are respected. Conversely, panic would correspond to the dangerous consequence of a broken taboo, or a not manageable situation would be psychologically understood as a punishment for taboos' infraction.

4. Panic and the PDI dimension

More work is necessary to ascertain if and how Panic considerations valid for High UAI countries (see the classic works of Freud, 1921, Canetti, 1960) may be valid also for the PDI dimension. For example, the Anglo-Saxons have some possible High PDI characteristics, at least in their past, like merged names for father and son, maternal uncle and nephew (see Guichard and Cuvillier, 1986). A consideration on this subject may be that the nearest equivalent of a High UAI group is given by a High PDI regime where the Power is acting equally on all members of the group, instead than differentially as in the Stem Family (see Appendix 3 point 2.2.). A possible anticipation may be that crowds of basically individualistic people may react unsatisfactorily to extreme conditions.
A partial confirm of these difficulties may be given by the fact that a closer study on the term Mass reveals its affinity with High UAI cultures, like the Germany one (see N. Bobbio et al., 1990).
However the scheme of the tight coupling between superiors and dependents is broadly existing in a culture derived from the Stem Family scheme like the Anglo-Saxon one, and may probably be used in extreme conditions as more suitable to them. It is however noticeable the fact that in the Encyclopaedia Britannica the term Panic is referred to the known conditions of alarm concerning money investments, in correspondence of economic crisis peaks. Life threatening must be in any case an even more extreme condition, and doubtfully it may be dealt with in the same terms as loss of money or property. Also about these aspects the correct perception of threat is expected to play an important role.

5. Considerations on panic and underestimation of threat

The considerations on the relevance of the dimension corresponding to High PDI, UAI and COLL values concerning the Panic phenomena are expected to find some possible limitation due to the difficulty of interaction between people of different Nationalities in a regime which, even if not recalling different Nationalities specifically, may be in the same dimension. It is the case then to underline that panic cases may be relatively easily controlled by a proper use of some authority, more specifically when the great majority of the passengers may have that need because of their origin.
More generally we may think that panic may be controlled by acting on passengers in two main ways:

- by reducing the anxiety levels by invitation to calmness, that is, by trying to reach a regime of Low COLL, PDI and UAI when stress levels are not too high, and when Passengers' population has suitable characteristics for it
- by imposing a suitable level of authority, as indicated above, when the stress levels are high and the Passengers' population characteristics are favorable to authority use (high PDI together with high UAI). In high UAI low PDI conditions the mass is guided only by an internal consensus, for which the best warranty is the existence of an egress flow (see Canetti), or possibly also of adequate barriers for smoke and fire where the egress is not possible.

If we then would assume that the crowd is always right, that is excluding the cases originating from personal phobias, the only remedies to panic would be aircraft constructive features. For the aspects of passengers' conduction the creation of psychosocial characteristics leading to a correct threat evaluation would be the main objective of the instructional provisions. It is also deemed important that the correct estimation of threat is reached not only within the aircraft for evacuations, but also for the concern of rulemaking and other safety provisions and activities.

A further note in addition to the above considerations on over- and underestimation of threat is that to the overestimation of threat may correspond two very different kinds of action: paralysis and different forms of hyperactivity (see also point 1. above). Therefore we may attempt to assimilate the underestimation of survival possibilities referred by H. Muir (1995) to the above overestimation of threat with consequent paralysis. This would be in agreement with the fact that paralysis is the typical behavior in conditions of no escape possibility.

6. Extreme conditions and similarities with some pathological manifestations.

There may be discussion about normality or illness of some typical human manifestations in extreme conditions: on one side we may say that in those conditions a corresponding extreme behavior and mental state are normal, but on the other side we may find great similarities of those manifestations with some pathological states. In fact for those who are someway inclined to mental illness it may be expected that the extreme conditions are favoring the manifestation of potential mental illness phenomena. It is for example a fact that in the 2nd world war a considerable part of USA soldiers has been sent home for psychological diseases to be connected to stress conditions (see A. Callegari, 1998).

A refinement of considerations on kinds of illness favored by different UAI regimes, as already
being done for anxiety, see Appendix 3, point 1.2., may contribute to the understanding and forecasting of reactions to extreme conditions.

A note on mental illness connected to aircraft accidents may be that this subject, unlike physical injuries, is few studied. The work of psychologists in such field should be made available and understandable from a typological and statistical viewpoint.

7. Some definitions

Panic - A note is that the definition of A. Callegari (see point 2 above) includes e.g. the cases of paralysis, while the normal use, e.g. in accident reports, is quite evidently including only the most dangerous and manifest forms of it. H. Muir (1994) is also adhering to this kind of definition. A greater agreement on the definition of Panic would favor the study of its aspects, or in any case of Behavioral Inaction and possibly Depersonalization (id.).

Survival, survivability – There is often confusion between the two terms (See e.g. the "Cherry Report", 1995). In fact there are no great doubts on effective survival, and these, if any, depend on fixing the time after the impact at which we want to state the effective survival. The term Survivability however would refer to the potential for survival, and this in turn may be referred either to the human potential to survive in a given accident, or also to the technical capability to increase survival through further improvements of the aircraft, operations or others. In any case this confusion may lead to not consider extreme conditions where avoidance of panic could lead to an increase of survival. In fact it may be expected that in extreme conditions panic is much frequent, if not always present. Also for those cases proceeding only inductively doesn't help us very much, and a comparison with an inferential understanding of the extreme conditions could be more effective in leading to some improvement.

Appendix 7 - Considerations on Evacuating Man modeling.
In addition to what exposed on modeling in Appendix 2, let's consider also the following.

A. - Kinds of management control
In order to simplify we may make reference to an article of the same Hofstede (1978) on the kinds of management control. These kinds may be summarized into two main kinds, as follows:
- by standards, and by mechanisms which normally include a feedback, but which may also present no feedback.
- by self-adjustments, e.g. in a self-regulating group.

This corresponds to what already seen. Briefly, we may have two main kinds of evacuation groups:
- a group (the words Community, Collectivity, would be more suitable) needing to follow precise rules, authority or both. This group would express contempt towards lack of precise rules, authority, towards anomie.
- a group tending to self- regulation (remember the so-called Queuing behavior). This group would also be contrary to the imposition by unjustified or unnecessary rules or authority.
Therefore, at least in the case of homogeneous evacuation groups, it would be opportune to choose the most suitable crowd management style by the Crew.

B. - On double-aspect reality modeling. Mental modeling
Another consideration may concern physical or mechanical, electrical or computerized models corresponding to the above: although any kind of model may be constructed, that is, although there are different physical means to realize a model for example fluid or mechanical, often one kind only is chosen to realize a physical model.
In addition we may consider that for example, in realizing a computerized model, our tendency to put ourselves in the position of an impartial observer, and therefore in realizing a "mechanical" model, is very strong. And our tendencies will be again enforced by the need to simulate by such model a certification test, that is, to satisfy a certification standard. On the other side we may already say that our model is more coherent with the possible reality of a real emergency evacuation guided by authority and precise rules than with a simulation test based e.g. on money rewards as direct motivation. And that, to simulate panic, our model should someway simulate the failure of the "mechanical" solidarity corresponding to the computer model formulae for normal evacuation.
We may also say that, insisting excessively on the rigid "mechanical" model, we may someway be driven, through rules and procedures, to loose the possibility to use in practice the qualities inherent to the self-coordinating and self-queuing group, qualities which may be useful in the more normal evacuation cases.

Therefore a first conclusion could be that, although these models are often much interesting and promising, as a first step direct mental considerations on real accidents, and also on partial experiments with humans, may be preferable as the nearest to the human nature.
We may call the above mental considerations "mental modeling", and "mental model processing". We may start to define some its characteristics. For example, the interested subject should know the alterations to such modeling, model processing and result which could be induced by his own personal characteristics and try to compensate for them, or also he

could at least furnish the details on his own characteristics, so that his work may be reevaluated and if needed corrected.
This practice would have similarities with the psychoanalysis of the apprentice-psychoanalysts before they can in turn psychoanalyze other persons. This should someway reflect the considerations of a person coordinating the results of the evacuation tests, or the results of studies on real evacuation cases.

Computerized modeling however may have possibilities far beyond some kind of capabilities of human mind or experimentation. In addition let's consider that a computer may introduce whatever rules or interactions in its algorithms.
In both cases however, mental modeling and computer modeling, the possibility to use the IBM or similar dimensions as a basis for mental considerations or modeling should be accounted for, as a noticeable possibility for a hopefully not too far future.

Appendix 8 – Various notes, other applications

1. - Data collection

Another note concerning real evacuations would be that countries situated meanly in the Low PDI, UAI, COLL ranges of values have a greater tendency to collect data, and therefore to compile adequate reports of the accidents. This would be in view also of their possible use in statistic evaluations. On the contrary countries situated meanly in the High PDI, high UAI, high COLL values would be less favorable to compile detailed accident reports, and also lesser favorable to make statistic evaluations on accidents. However they are more favorable to preventive theorization, and this hasn't to be excessively criticized from the other side. The best would be synergism between data collection and anticipations.

A greater difficulty in collecting data may also concern evacuation tests done on High PDI, UAI and/or COLL populations.

2. - Specialists' viewpoints

NOTE. The subjects and data listed in present essay have to be considered an exposition of considerations, studies in evolution, for the purpose of further discussion and the development of more specific research initiatives. One of their aspects is then to be directed to enhance thoughts of both engineers and other professional men like psychologists, and their reciprocal understanding and cooperation.

3. Cross-cultural psychology

A view on psychologists concerning multi-culture is also interesting. In fact there may be the possibility that in the field of psychology often only own country regime is deemed psychologically normal. For this kind of problems see in Okonji, 1980, citing Jahoda: "…progress in psychology is likely to be linked to a large extent with the growth of activity in this sphere (that of cross-cultural studies)".

4. Way forward

As a practical conclusion whenever the study of evacuations is deemed important the development of the following main aspects concerning evacuation is recommended.

a. **Keeping into account the characteristics of different countries and cultural areas**
b. Keeping into account the operational aspects of **extreme conditions,** e.g. by the analysis of the real cases, theory, calculations
c. Developing adequate **theories** (e.g. departing from C. Perrow's theory) **and/or models, system's views** and comparing them with experimental data **and** evacuation real cases.

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